REMARKS

Election/Restriction

Claims 1-48 are currently pending in the application. Claims 47-48 are newly added and find support throughout the specification, including pages 19-20. Claims 15-46 have been withdrawn by the Examiner as being drawn to a nonelected group. Claims 4, 6, 8-9 and 14 have been withdrawn by the Examiner as being drawn to a non-elected species. Claims 1-3, 5, 7, 10-13 and 47-48 are under examination.

Claims 1-3, 5, 7, and 10-13 are amended. The claim amendments find support in the specification and is discussed in the relevant sections below. No new matter is added.

Claim Rejections-35 USC 112

Claims 1-3, 5, 7 and 10-13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly clam the subject matter which applicant regards as the invention.

A. The Office Action asserts that Claim 1 and its dependent claims are indefinite because Claim 1 recites the term "activated". The Office Action asserts that " The term "activated" is a relative term which renders the claim indefinite", and that "It is simply unclear what structure is covered by the terminology '*activated* dendrimer polyamine'".

Applicant has amended claim 1 to more clearly define the invention. Applicant also notes that the specification clearly discloses the meaning of the term "activated dendrimer polyamine". Page 16, lines 13-15 of the specification discloses " reacting the dendrimer coated surface with a reagent which activates the amino groups so as to render the surface reactive with a substance comprising hydroxyl or amine groups". In this instance, the surface being referred to is the "chemically reactive surface" comprising the dendrimer coating. Pages 19-20 of the specification further discloses this activation of the dendrimer as follows:

"The present invention provides a bi-functional cross linking reagent to convert the dendrimeric terminal amine groups on the surface to their activated form. Accordingly the surface is reacted for between 1-3 hours in an

aqueous solution comprising an activating reagent, DMF , and anhydrous pyridine. Activating reagents useful in the present invention include, but are not limited to phenylendiisothiocyanate, disuccinimidylcarbonate, phenylendiisocyanate, disuccinimidyloxalate, bis-2-succinimido-oxycarbonyloxyethyl sulfone (BSOCOES), sulfo-BSOCOES, bis-sulfosuccinimidyl-disuccinimidyl tartarate (DST), sulfo-DST, ethylene glycol bis-succinimidylsuccinate (EGS), dimethylsuberimidate, and other similar homo- or hetero-bifunctional cross linking reagents. Subsequent to surface activation, the surface is washed with DMF and dichloroethane and then dried with compressed air. Once the surface is dry, it may be stored in its activated state at room temperature, and under anhydrous conditions for at least three months".

Based on this disclosure, it is clear that the structure which is covered by the terminology "activated dendrimer polyamine" is a dendrimer polyamine in which the dendrimeric terminal amine groups are reactive with a substance comprising a hydroxyl group or amine group. The structure of a dendrimer polyamine is disclosed in the specification (pgs 18-20) as comprising branch points and terminal residues, a said branch point of said dendrimer comprising either a secondary or a tertiary amine, a said terminal residue comprising a moiety selected from the group consisting of primary amine, hydroxyl, carboxyl, and thiol. The specification discloses on pages 19-20 that a dendrimer is activated by incubating it with an activating reagent, DMF, and an anhydrous pyridine, thereby forming a product in which the dendrimeric terminal amine groups are reactive with a substance comprising a hydroxyl group or amine group.

Claim terms are to be interpreted in light of the intrinsic evidence (*i.e.*, the claims at issue, the specification, and the prosecution history. See, *e.g.*, *McGill Inc. v. John Zink Co.*, 736 F.2d 666, 673-675, 221 U.S.P.Q. 944, 948-951 (Fed. Cir. 1984), *cert. denied*, 105 S.Ct. 514 (1984); *Fromson v. Advance Offset Plate, Inc.*, 720 F.2d 1565, 1569-1571, 219 U.S.P.Q. 1137, 1140-1141 (Fed. Cir. 1983)). In view of the disclosure in the specification of an activated dendrimer polyamine as derscribed above, Applicant contends that the structure of an *activated* dendrimer polyamine is clear and definite.

The Office Action further asserts that "it is unclear if the claimed product comprises only the solid surface with the covalently bonded 'activated dendrimer polyamine' or if the claimed product comprises the solid surface, the 'activated dendrimer polyamine' and the 'substance comprising a hydroxyl group or amine group' " The Office Action further notes that the terminology of the phrase "chemically reactive surface reactive with..." causes this ambiguity,

and further comments that "it appears that these recitations are merely intended use recitations, which are not afforded any patentable weight".

In response, Applicant has amended claim 1 and claims 10 and 11, so that the specific components of the claimed product are recited, thereby eliminating the asserted ambiguity of what components constitute the claimed product. The claimed product of newly amended Claim 1, a chemically reactive surface, minimally comprises a solid surface with the covalently bonded "activated dendrimer polyamine". The claimed product of newly amended Claims 10 and 11, a chemically reactive surface, minimally comprises a solid surface with the covalently bonded "activated dendrimer polyamine", and further comprises a substance comprising a hydroxyl group or amine group. Applicant has also amended claim 1 to recite "A chemically reactive surface which is reactive with a substance comprising a hydroxyl group or amine group,..." and to recite that the terminal groups of said activated dendrimer polyamine are reactive with a substance comprising a hydroxyl group or amine group through said hydroxyl group or amine group

In view of these amendments to claims 1, 10 and 11, Applicant contends that the components comprised by the products is clear, and that the product of said claims has the property of being reactive with a substance comprising a hydroxyl group or amine group through said hydroxyl group or amine group. Further, Applicant has newly added claims 47-48 which include the definition of an activated dendrimer polyamine. Since the instant claims are directed to a product with a defined structure which confers the recited functional properties, Applicant contends that the issue of intended use has been addressed. Accordingly, reconsideration and withdrawal of the rejection is requested.

B. The Office Action asserts that Claim 5 is indefinite because "it is unclear how the silane containing moiety is to covalently bond the dendrimer polyamine (i.e. the linkage sites to the dendrimer and the surface are not shown)". The linkage sites of the silane containing moiety to the glass are disclosed on page 17 of the specification and are well known to one of skill in the art. The linkage sites of the silane containing moiety to the polyamine are disclosed on pages 18-19 as follows:

"In an alternate embodiment, the dendrimer polyamine may be fabricated stepwise on the surface. Following the reaction with a reagent containing a terminally unsaturated carbon, the surface is reacted with a first amine group containing compound having the general formula:

$$NH_2(CH_2)_mY[(CH_2)_nY]_x(CH_2)_mNH_2,$$

wherein m,n equals 1-15, x equals 4-15, and Y is O, or NH. In a preferred embodiment, the first amine group containing compound is pentaethylenhexamine. Subsequent to reacting the surface with a first amine group containing compound, the surface is reacted a second time with the reagent comprising a terminally unsaturated carbon as described above. The surface is then reacted with a second amine group containing compound, selected from a group of compounds including, but not limited to tetraethylenpentamine, 1,4-bis-(3-aminopropoxy)butane, 4-aminomethyl-1,8-octadiamine, 4,7,10-trioxa-1,13-tridecandiamine, N,N-dimethyl-1,6-hexadiamine, 2-(2-aminoethoxy)ethanol, jeffamine 130, 3-amino-1,2-propandiol, hexandiamine, cyclohexandiamine, pentaethylenehexamine, polyethylenepolyamine, and $NH_2(CH_2CH_2NH)_nCH_2CH_2NH_2$, where n = 2, 4, 5-12. The surface is reacted with either of the first or second amine group containing compound for between 48 and 72 hours in a solution containing the amine group containing compound and anhydrous, amine-free dimethylformamide (DMF) at room temperature".

Because the linkage sites between the dendrimer and the surface are disclosed in the specification as described above, Applicant contends that claim 5 is therefore not indefinite. Accordingly, reconsideration and withdrawal of the rejection is requested.

C. The Office Action asserts that Claim 7 is indefinite because it is unclear how there can be $[15]^n$ terminal primary amine groups since the structure of the dendrimer primary amine in question is not set forth in the claim. However, in referring to the terminal residue of the recited dendrimer polyamine, Claim 1 recites that "...said terminal residue comprises a moiety selected from the group consisting of primary amine...". Further, Applicant notes that the specification discloses on page 18 that the dendrimer polyamine "comprises $[15]^n$ terminal amine groups, and that dendrimer polyamines are well known in the art and can be obtained from any commercial source known in the art. Page 18 of the specification also discloses that "a dendrimer polyamine is a macromolecular polymer with regular, dendritic branching with radial symmetry composed of an initiator core, interior layers (or generations) of repeating units radially attached to the core, and an exterior surface of terminal functional groups". Page 18 of the specification also discloses that a "dendrimer polyamine useful in the present invention may include, but may not be limited to, polypropylenimine hexadecaamine, polypropylenimine

tetraamine dendrimer, polypropylenimine octaamine dendrimer, polypropylenimine hexadecaamine dendrimer, polypropylenimine dotriacontaamine dendrimer, and polypropylenimine tetrahexacontaamine dendrimer". Because the structure of the dendrimer is disclosed in detail in the specification, especially on page 18, as is the limitation that the dendrimer polyamine comprises $[15]^n$ terminal amine groups, Applicant contends that Claim 7 is definite. Accordingly, reconsideration and withdrawal of the rejection is requested.

D. The Office asserts that "Claim 10 lacks a conjunction between the members of the Markush group , which renders the claim confusing". Accordingly, Applicant has amended claim 10 to recite "The surface of claim 1, wherein said substance comprising a hydroxyl group or amine group is selected from the group consisting of DNA, RNA, and polypeptides". In view of said amendment, Applicant contends that the meaning of Claim 10 is clear. Accordingly, reconsideration and withdrawal of the rejection is requested.

Claim Rejections – 35 U.S.C. 102

Claims 1-3, 5, 7 and 10-13 are rejected under 35 U.S.C. 102(e) as being anticipated by Kim et al. (US 2002/0006626 A1).

Applicant submits that for a determination of anticipation to be proper, the prior art reference must disclose each and every limitation of the claim. *Atlas Powder Company et al. v. IRECO, Incorporated et al.*, 190 F.3d 1342, 1347 (Fed. Cir. 1999).

The Office Action states that Kim et al. disclose "a monolayer of functionalized dendrimers on a solid surface that are reacted with biomolecules", that the "dendrimers are polyamines with primary amine terminal groups", and that "a glass surface is treated with a silane and then reacted with a dendrimer which is further reacted with a biomolecule". The Office Action further states that "Dendrimers of different generation (different size, i.e. number of end groups) are disclosed".

Applicant contends that the dendrimers taught by Kim et al are structurally and functionally distinct from the activated dendrimers instantly claimed . The reactive surface of the instant claims comprises an activated dendrimer polyamine which covalently binds a substance

comprising a hydroxyl or amine group through the hydroxyl group or amine group of the substance. The specification discloses on page 20 that moieties comprising said hydroxyl and amine groups include unmodified DNA, RNA protein or peptide.

In contrast to the activated dendrimers of the instant invention, the dendrimers taught by Kim et al. are characterized as functionalized dendrimers (see paragraph 2) which react with biomolecules such as proteins, antigens, antibodies, enzymes, ligands, and receptors. The activated dendrimer polyamines of the instant invention and the functionalized dendrimers of Kim et al. are prepared by distinct methods which produce dendrimers that display distinct reactivities. Kim et al teach that a method of preparing a monolayer of dendrimeric amine groups which encompasses incubating a substrate with a solution of dithioproprionic acid bis-N-hydrosuccinimide ester in DMSO, followed by immersion in a solution of amine terminated dendrimer. Kim et al. also teach an alternative preparation method wherein a methanolic solution of amine terminated dendrimers is incubated with an aldehyde silane-coated glass slide. (See paragraphs 20-25 and 36 of Kim et al.). The method of Kim et al does not include the activating step of converting the dendrimeric terminal amine groups on the surface to their activated form by reacting them in an aqueous solution comprising an activating reagent, DMF , and anhydrous pyridine as disclosed in the instant specification on pages 19 and 20, and described supra.

That the reactivity of the instantly claimed activated dendrimer polyamines is distinct from the functionalized dendrimers taught by Kim et al. is demonstrated by the fact that Kim et al. does not teach dendrimers that react with DNA or RNA, as do the activated dendrimer polyamines of the instant invention. Further, Kim et al. teach in paragraph 23 that amine containing dendrimers have high reactivity to aldehyde groups, which is distinct from the reactivity to hydroxyl or amine groups displayed by the activated dendrimer polyamines of the instant invention.

Also, Kim et al do not teach functionalized amine containing dendrimers which are reactive with unmodified proteins and peptides as are the instantly claimed activated dendrimer polyamines as disclosed in lines 20-25 of page 4 and in lines 15-20 of page 20 of the

instant specification. Kim et al. teaches in paragraph 27 that "biomolecules containing sugar chainsat the surface like immunoglobulins and other glycoproteins" are modified prior to reacting with the functionalized amine containing dendrimer monolayers. The modification is oxidizing the sugar groups of the biomolecule to form aldehyde end groups which are reactive with the functionalized amine containing dendrimer monolayers.

In light of the above-mentioned structural and functional differences between the functionalized amine containing dendrimers present in a monolayer on a surface taught Kim et al and the activated dendrimer polyamines present in the chemically reactive surface of the instant invention, the cited reference does not anticipate the instant invention. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection.

Claims 1-3, 5, 7 and 10-13 are rejected under 35 U.S.C. 102(e) as being anticipated by Manzer et al. (US 6,288,253 B1).

Applicant traverses the rejection on the grounds that Manzer et al. does not teach each and every aspect of the claimed invention. Applicant agrees with the Office Action's statement that Manzer et al disclose the following; "dendrimers attached to a silica surface", that "The dendrimers are polyamines with primary amine terminal groups", that a silica gel surface is treated with a silane and then a dendrimer is built up on the surface" and that "Dendrimers of different generation (different size, i.e. number of end groups) are disclosed".

However, Applicant notes that Manzer et al does not teach the limitation required by the instant claims that the chemically reactive surface comprise an activated dendrimer polyamine. There is no disclosure by Manzer that the dendrimer polyamine is activated. Because Manzer et al does not teach a chemically reactive surface comprising an activated dendrimer polyamine, the cited reference does not anticipate the instant invention. Accordingly, Applicant respectfully requests reconsideration and withdrawal of this rejection.

Conclusion

Applicant submits that all claims are allowable as written and respectfully request early favorable action by the Examiner. If the Examiner believes that a telephone conversation with Applicant's attorney/agent would expedite prosecution of this application, the Examiner is cordially invited to call the undersigned attorney/agent of record.

Respectfully submitted,

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